Total No. of Questions : 8]

SEAT No. :

**P978**

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## S.E. (Automobile & Mechanical/Mechanical(Sandwich))

## ELECTRICAL AND ELECTRONICS ENGINEERING

## (2019 Pattern) (Semester - III) (203156)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates :***

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

***Q1)*** a) Draw a neat sketch of 4 - Pole DC machine. Label main parts of it. State the function of any three parts. **[6]**

b) Derive an expression for armature torque developed in a DC motor. **[6]**

c) A 250 V DC shunt motor with armature resistance of 0.5Ω runs at 600 rpm on full load and draws an armature current of 20A. If resistance of 1Ω is added in series with armature winding, find the speed at half load condition. Assume that flux is maintained constant. **[6]**

OR

***Q2)*** a) Explain any two methods of speed control of DC shunt motor. **[6]**

b) Explain regenerative braking in a DC shunt motor with the help of neat diagrams. Also enlist any two applications of regenerative braking. **[6]**

c) The armature resistance of a DC shunt motor is 5.8 Ω. At full load condition, it runs at 1725 rpm drawing armature current of 10A from 230 V DC supply. Find full load torque and starting torque. Assume that flux is maintained constant. **[6]**

***Q3)*** a) Derive general expression for torque in a three phase induction motor and hence obtain condition for maximum torque. **[6]**

b) Draw a neat sketch of star- delta starter used for starting a three phase induction motor and explain it's operation. **[6]**

c) A 6 - pole, 50 Hz, 3 phase induction motor runs at 960 rpm when torque on shaft is 200 Nm. If the stator losses are 1400 W, friction and windage loss are 550 W, calculate i) Power output ii) Rotor copper loss. **[5]**

***P.T.O.***

OR

***Q4)*** a) Describe in brief any one method for the speed control of a three phase induction motor. **[6]**

b) A 3 phase induction motor having 6 - pole, star- connected stator winding runs on 240 V, 50 Hz supply. The rotor resistance and standstill reactance are 0.12Ω and 0.85 Ω per phase. The ratio of stator to rotor turns is 1.8. full load slip is 4%. Calculate the i) Torque at full load and ii) Maximum torque. **[6]**

c) Explain in brief about the modification in squirrel cage motor with deep bar rotor construction and state the advantages of this modified construction. **[5]**

***Q5)*** a) What is an Electric Vehicle (EV)? Explain in detail functions of components of an EV. **[6]**

b) Explain the impact of use of electric vehicles on power grid. **[6]**

c) Differentiate between Battery EV and Hybrid EV. **[6]**

OR

***Q6)*** a) What are types of Electric Vehicles? Explain in detail schematic of fuel Cell EV. **[6]**

b) Explain the Configuration of a series Hybrid EV. **[6]**

c) Elaborate on the challenges faced by EV technology in present context. **[6]**

***Q7)*** a) Mention the ingredients of cathode and anode for following batteries. **[6]**

i) LFP battery

ii) NMC battery

iii) LMO battery

b) Explain the operation of a three phase induction motor drive for an EV with the help of a block diagram. **[6]**

c) Explain the working of hydrogen fuel cell. **[5]**

OR

***Q8)*** a) Draw the block diagram of Battery Management system (BMS) and explain the working of it. **[6]**

b) State advantages and disadvantages of LFP Battery. **[6]**

c) Explain the factors for selection of motor for an EV. **[5]**

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